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580,301 COMPLETE SPECIFICATION 1 SHEET

200-153.R 17

[This Drawing is a reproduction of the Original on a reduced scale.]

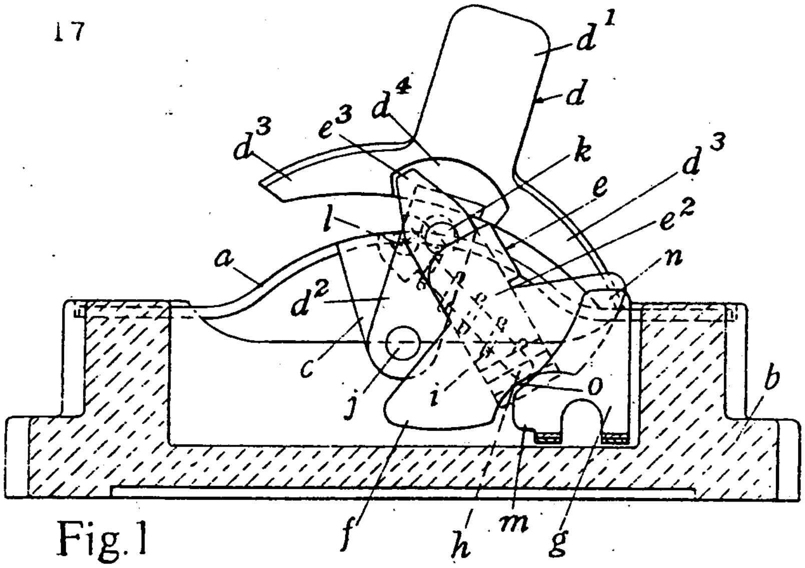

Fig.1

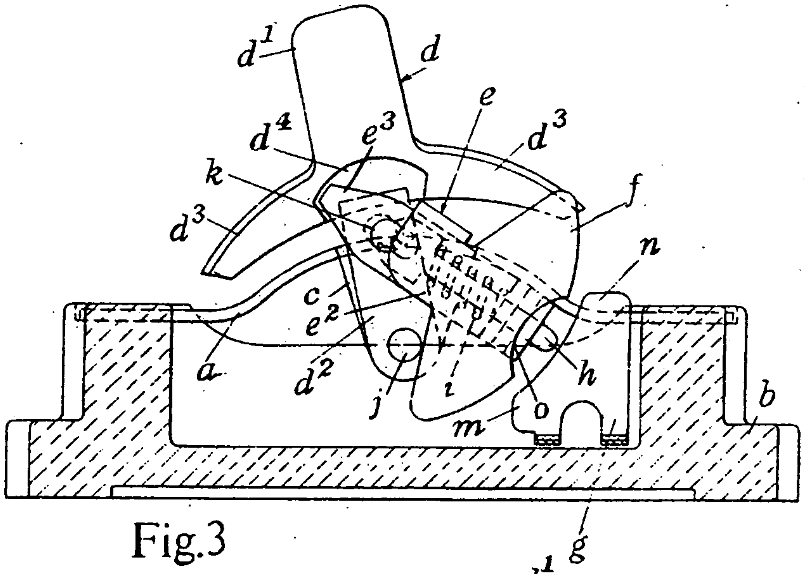

Fig.3

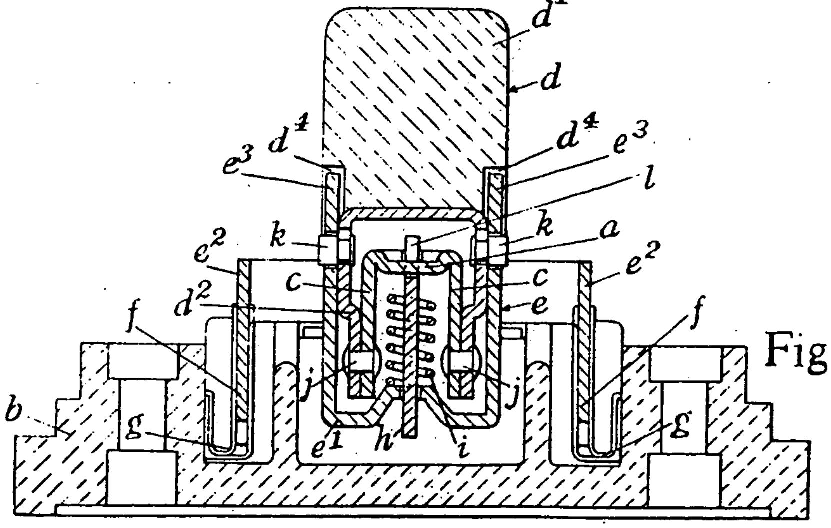

Fig.2

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H.M.S.O.(Ty.P.)

EXAMINERS
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PATENT SPECIFICATION

580,301

Application Date: June 28, 1944. No. 12298/44.

Complete Specification Left: June 26, 1945.

Complete Specification Accepted: Sept. 3, 1946.

PROVISIONAL SPECIFICATION

Improvements relating to Electric Tumbler Switches

We, HENRY ALLDAY & SON (1922) LIMITED, a British Company, of 19 to 21, Warstone Lane, in the City of Birmingham, and ROBERT BAIN, a British Subject, of the Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to electric switches of the tumbler type in which a movable contact piece is operable by a finger lever through the medium of a spring-loaded toggle mechanism. Ordinarily such a switch is required to operate with a quick action both when making and breaking a circuit. But when applied to alternating current circuits it is desirable that only the making of the circuit shall be effected quickly, it being advantageous to effect the breaking of the circuit at a relatively slow rate for the purpose of minimising arcing at the contacts. The object of the present invention is to enable this requirement to be met in a simple and satisfactory manner.

The invention comprises a switch of the aforesaid type which is adapted to effect separation of the fixed and movable contacts under the control of the user before the toggle mechanism passes its dead-centre position, continued movement of the movable contact beyond that position being effected independently of the user by the previously energised spring of the toggle mechanism.

In one manner of constructing a switch in accordance with the invention, we employ a modification of the mechanism illustrated in Patent Specification No. 443,748 (Bain and Allday). This mechanism comprises a bridge piece mounted on a base and provided with a pair of depending lugs, a finger lever pivoted at its inner end to the inner ends of the lugs, a contact arm pivoted on the finger lever at about its centre, and a toggle link having one end pivoted on the bridge piece and the other end slidably connected to the contact arm, a compression spring being mounted on the said link with one end supported by the arm. This mechanism was intended for a switch adapted to operate with both a quick-make and a quick-break action. To enable it to achieve the purpose of the present invention we introduce two changes. According to the one, we arrange the pivot point at one end of the toggle link a little nearer to the pivot point between the bridge and the finger lever than would be suitable for a quick-make and break switch. According to the other change we vary the form of one or other of the contacts. In one convenient construction we provide an arcuate lateral extension on each end of the contact arm for co-operating with the fixed contacts on the base, and the fixed contacts may also be suitably modified in shape to enable them to co-operate with the movable contacts in the desired manner.

The construction and arrangement of actuating mechanism and contacts are such that when the switch is closed, the required separation of the contacts is effected while the user is moving the finger lever against the spring action to the dead centre position. This movement is effected under the control of the user, and the strength of the spring is such that the said movement cannot easily be effected at such a rapid rate as would defeat the object in view. Moreover, as the spring resistance increases when the dead centre position is approached, there is thereby introduced a natural tendency for a dwell or pause to be caused momentarily in the movement of the finger lever just before it is pushed over that position. By the time the finger lever reaches the dead centre position the contacts will have separated sufficiently (the amount of separation required being small) to interrupt the circuit and allow the resulting small arc to be extinguished by the cyclic reversal of the applied voltage. The continued movement of the contact arm beyond the dead centre position to its other limit of movement is effected by the previously energised spring and independently of the user.

When it is required to close the switch the finger lever is moved in the opposite direction. In this case the first half of the movement is effected as before against the action of the spring until the dead centre is reached, but after passing the dead centre the movable contact arm is advanced into engagement with the fixed contacts by the spring and at a rapid rate which is not controllable by the user. We are thus able to obtain in a very simple and satisfactory manner the required slow break and quick make which is desirable in tumbler switches for use in alternating current circuits.

The invention is not, however, restricted to the example above described as subordinate details may be modified to suit different requirements.

Dated this 27th day of June, 1944.

MARKS & CLERK.

COMPLETE SPECIFICATION

Improvements relating to Electric Tumbler Switches

We, Henry Allday & Son (1922) Limited, a British Company, of 19 to 21, Warstone Lane, in the City of Birmingham, and Robert Bain, a British Subject, of the Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to electric tumbler switches of the type in which a movable contact piece is operable by a finger lever through the medium of a spring-loaded toggle mechanism. Ordinarily such a switch is required to operate with a quick action both when making and breaking a circuit. But when applied to alternating current circuits it is desirable that only the making of the circuit shall be effected quickly, it being advantageous to effect the breaking of the circuit at a relatively slow rate for the purpose of minimising arcing at the contacts. The object of the present invention is to enable this requirement to be met in a simple and satisfactory manner.

The invention comprises a switch of the aforesaid type which is adapted to effect separation of the fixed and movable contacts under the control of the user before the toggle mechanism passes its dead-centre position, and in which continued movement of the movable contact piece beyond that position is effected independently of the user by the previously energised spring of the toggle mechanism, the fixed and movable contacts being shaped and arranged so that the distance by which they are separated under the control of the user remains constant during the initial part of the movement of the movable contact piece by the spring.

In the accompanying sheet of explanatory drawings:—

Figures 1 and 2 are part sectional side views taken at right angles to each other of an electric switch embodying the invention.

Figure 3 is a similar view to Figure 1 illustrating the switch mechanism in a different position.

The switch shown in the drawings comprises a bridge piece *a* mounted on a recessed base *b* and provided with a pair of depending lugs *c*, a finger lever *d* pivoted at its inner end to the inner ends of the lugs, a contact arm *e* pivoted on the finger lever at about the centre thereof and formed or provided with a pair of contacts *f*, a pair of complementary fixed contacts *g* on the base, and a toggle link *h* having one end pivoted at *l* to the bridge piece and the other end slidably connected to the contact arm, a compression spring *i* being mounted on the toggle link with one end supported by the contact arm. The finger lever *d* consists of a finger piece d^1, made from insulating material, and a stirrup-like part d^2 made from metal strip, the stirrup-like part being secured at its closed end to the finger piece, and the open end of the said part being pivoted at *j* to the lugs *c* on the bridge piece *a*. The contact arm *e* is made from metal strip shaped to form a central portion e^1 of substantially **U**-shape, and arms e^2 at the outer sides of the central portion, the latter being pivoted at *k* to the stirrup-like part d^2 of the finger lever, and the free ends of the arms being formed or provided with the contacts *f*. The stationary contacts *g* consist of resilient jaws between which the contacts *f* are movable.

The switch above described in similar to that described in Patent Specification No. 443,748 (Bain and Allday) with the exception that, instead of being adapted to operate with both a quick-make and a quick-break action, it is adapted to operate with a relatively slow break action. To enable the latter effect to be obtained we introduce two changes as compared with the switch described in the above mentioned specification. One of these changes consists in arranging the pivot *l* of the toggle link *h* a little nearer to the pivot *j* between the bridge piece *a* and the finger lever *d* than would be suitable for a quick-make and break switch. The other change consists in varying the form of the contacts *f*, *g*. Thus in the example shown each of the movable contacts *f* is of segmental form and extends laterally from opposite sides of the arm, whilst the adjacent edges of the fixed contacts *g* are made to a concave form to enable them to cooperate with the movable contacts in the desired manner.

The switch above described is shown in its closed position in Figure 1. To open the switch the required separation of the contacts *f*, *g* is effected while the user is moving the finger lever *d* against the action of the spring *i* to a dead centre position in which the pivot axis of the contact arm *e* is in line with the axis of the toggle link *h*. This movement is effected under the control of the user, and the strength of the spring *i* is such that the said movement cannot easily be effected at such a rapid rate as would defeat the object in view. Moreover, as the spring resistance increases when the dead centre position is approached, there is thereby introduced a natural tendency for a dwell or pause to be caused momentarily in the movement of the finger lever *d* just before it is pushed over that position. By the time the finger lever *d* reaches the dead centre position the contacts *f*, *g* will have separated sufficiently (the amount of separation required being small) to interrupt the circuit and allow the resulting small arc to be extinguished by the cyclic reversal of the applied voltage. This separation of the contacts *f*, *g* is shown in Figure 3. Immediately the finger lever *d* passes the above mentioned dead centre position the previously energised spring *i* not only causes completion of the finger lever movement, but also causes rapid angular movement of the contact arm *e* to its other limit position independently of the user. By virtue of the segmental form of the movable contacts *f* and the adjacent concave edges of the fixed contacts *g*, the width of the gaps between the separated contacts remains constant during the initial part of the rapid angular movement of the contact arm *e*, thereby facilitating extinction of the arc.

When it is required to close the switch the finger lever *d* is moved in the opposite direction. In this case the first half of the movement is effected as before against the action of the spring *i* until the dead centre is reached, but after passing the dead centre the movable contact arm *e* is advanced into engagement with the fixed contacts *g* by the spring and at a rapid rate which is not controllable by the user. We are thus able to obtain in a very simple and satisfactory manner the required slow break and quick make which is desirable in tumbler switches for use in alternating current circuits.

To facilitate easy entry of the movable contacts *f* between the jaws of the fixed contacts *g*, these jaws may be formed at their lower ends with outwardly splayed lips as *m*. Also similar lips as *n* may be provided at the upper ends of the jaws, and the adjacent edges of the movable contacts *f* may be formed with central recesses *o*, so that in the event of the finger lever *d* being released before reaching the dead centre position above mentioned during opening of the switch, the parts of the movable contacts at the ends of the said recesses enter the lips *m*, *n* and thereby serve to facilitate re-engagement of the contacts *f*, *g*.

The finger piece d^1 of the finger lever is formed at its inner end with lateral projections d^3 which serve by contact with adjacent parts of the bridge piece *a* to limit the angular movement of the finger lever.

To limit the angular movement of the contact arm *e* relatively to the finger lever *d*, the contact arm is formed with extensions e^3 which extend into recesses d^4 in the adjacent sides of the finger piece d^1, the ends of the recesses serving by contact with the said extensions to bring the contact arm to rest.

The invention is not limited to the example above described as subordinate details may be varied to suit requirements.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A tumbler switch of the type specified which is adapted to effect separation of the fixed and movable contacts under the control of the user before the toggle mechanism passes its dead-centre position, and in which continued movement of the movable contact piece beyond that position is effected independently of the user by the previously energised spring of the toggle mechanism, the fixed and movable contacts being shaped and arranged so that the distance by which they are separated under the control of the user remains constant during the initial part of the movement of the movable contact piece by the spring.

2. A tumbler switch as claimed in Claim 1 and comprising the combination and arrangement of parts substantially as described and as illustrated by the accompanying drawings.

Dated this 25th day of June, 1945.

MARKS & CLERK.

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